इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 2245 (1962): Methods of sampling quartizite [MTD 13: Ores and Raw Materials]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

Indian Standard
METHODS OF SAMPLING QUARTZITE

(First Reprint JUNE 1980)

UDC 553.57:620.11

© *Copyright* 1963

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

[redacted] Gr 4 *February* 1963

Indian Standard
METHODS OF SAMPLING QUARTZITE

Methods of Sampling Sectional Committee, SMDC 4

Chairman	*Representing*
Dr. A. V. Sukhatme	The Tata Iron & Steel Co. Ltd., Jamshedpur
Members	
Shri V. D. Agarwal	Aluminium and Aluminium Alloys Sectional Committee, SMDC 10, ISI
Shri J. C. Banerjee	Refractories Sectional Committee, SMDC 18, ISI
Shri A. K. Bhattacharya	Ministry of Railways
Shri M. N. Bhide (*Alternate*)	
Dr. M. K. Bose	Precious Metals Sectional Committee, SMDC 13, ISI
Shri K. C. Choudhuri	Copper and Copper Alloys Sectional Committee, SMDC 11, ISI
Shri H. R. Dewan	Indian Bureau of Mines (Ministry of Steel, Mines and Fuel), Nagpur
Shri V. K. S. Varadan (*Alternate*)	
Shri M. L. Dutt Roy	Steel Castings Sectional Committee, SMDC 20, ISI
Shri D. N. Elchidana	Italab Private Ltd., Bombay
Shri S. S. Honavar (*Alternate*)	
Shri J. P. Patel (*Alternate*)	
Shri B. B. Ghoshal	Indian Iron & Steel Co. Ltd., Burnpur
Shri J. N. Barman (*Alternate*)	
Shri A. Guha	Cast Iron & Malleable Cast Iron Sectional Committee, SMDC 9, ISI
Shri P. L. Jain	Steel Tubes, Pipes and Fittings Sectional Committee, SMDC 22, ISI
Dr. N. Jayaraman	Essen & Co., Bangalore
Shri K. N. Gururajachar (*Alternate*)	
Shri H. J. Kamdar	Lead, Zinc, Tin, Antimony and Their Alloys Sectional Committee, SMDC 12, ISI
Shri R. M. Krishnan	Foundry Sectional Committee, SMDC 17, ISI
Shri D. B. Lahiri	Indian Statistical Institute, Calcutta
Dr. A. Matthai (*Alternate*)	
Shri R. D. Lalkaka	Pig Iron & Ferro-Alloys Sectional Committee, SMDC 8, ISI
Shri D. R. Malik	Directorate General of Ordnance Factories (Ministry of Defence), Calcutta
Shri R. N. Datta (*Alternate*)	
Shri A. Soundararaj (*Alternate*)	
Shri N. T. Mathew	Army Headquarters
Shri M. N. Bhattacharya (*Alternate*)	

(*Continued on page* 2)

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

(Continued from page 1)

Members	*Representing*
Shri N. Mazumdar	Indian Non-Ferrous Metals Manufacturers' Association, Calcutta
Shri M. M. Moudgill *Alternate*)	
Shri N. C. Mitra	Government of India Mint (Ministry of Finance)
Dr. M. K. Bose (*Alternate*)	
Shri S. N. Mukerji	Government Test House, Calcutta
Shri D. S. Murty	Defence Production and Inspection Organization (CGDP) (Ministry of Defence)
Dr. R. K. Dutta (*Alternate*)	
Shri E. K. N. Nambiar	Directorate General of Supplies & Disposals (Inspection Wing) *and* Wrought Steel Products Sectional Committee, SMDC 5, ISI
Shri G. V. Halwe (*Alternate*)	
Shri A. Padmanabhan	Steel Forgings Sectional Committee, SMDC 21, ISI
Dr. B. C. Roy	Ores & Raw Materials Sectional Committee, SMDC 16, ISI
Shri A. Sangameswara Rao	Methods of Chemical Analysis Sectional Committee, SMDC 2, ISI
Shri S. Viswanathan	Methods of Physical Tests Sectional Committee, SMDC 3, ISI
Shri B. N. Singh, Assistant Director (Statistics)	Director, ISI (*Ex-officio Member*)

Secretary

Shri S. R. Kuppanna
Extra Assistant Director (Statistics), ISI

Subcommittee on Sampling of Ores, SMDC 4 : 3

Convener	
Shri B. B. Ghoshal	Indian Iron & Steel Co. Ltd., Burnpur
Members	
Mr. E. B. Hall	Bird & Co. Ltd. (Research Department), Calcutta
Shri K. L. Dua (*Alternate*)	
Shri G. V. Halwe	Directorate General of Supplies & Disposals (Inspection Wing) (Ministry of Works, Housing & Supply)
Dr. N. Jayaraman	Essen & Co., Bangalore
Shri M. R. G. Sharma (*Alternate*)	
Shri M. M. Moudgill	Indian Aluminium Co. Ltd., Calcutta

Indian Standard
METHODS OF SAMPLING QUARTZITE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 November 1962, after the draft finalized by the Methods of Sampling Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 If the ore is a pure mineral or is uniform in composition, sampling will be a very simple task, since any small portion of the ore will represent the entire bulk. But when it is recalled that the ore is in reality, physical or mechanical mixture of many different substances, and the proportion of substances other than the pure mineral is subject to wide variation, even in a single deposit, the difficulty and importance of proper sampling can be easily realized.

0.3 For the purpose of sampling, quartzite available in this country has been classified into the following three categories on the basis of ore sizes:

a) Run-of-mine — ore of all sizes up to 250 mm;

b) Crushed and screened, large size — ore of sizes not more than 150 mm and not less than 50 mm; and

c) Crushed and screened, small size — ore of sizes not more than 50 mm.

0.4 Taking into consideration the views of producers, testing authorities and technologists, the Sectional Committee responsible for the preparation of this standard felt that it should be related to the sampling procedures followed in the country in this field. Furthermore, due weightage had to be given to the need for international co-ordination among standards prevailing in different countries of the world. These considerations led the Sectional Committee to refer to JIS M 8501 (1950) Methods of Sampling Nonmetallic Ores issued by the Japanese Standards Association.

0.5 This standard is one of a series of Indian Standards on sampling of ores and aggregates; other standards in this series are:

IS : 1405-1960 METHODS OF SAMPLING IRON ORES
IS : 1449-1961 METHODS OF SAMPLING MANGANESE ORES
IS : 1811-1961 METHODS OF SAMPLING FOUNDRY SANDS
*IS : 1999-1962 METHODS OF SAMPLING BAUXITE

---

*Under print.

*IS : 2109-1962 METHODS OF SAMPLING DOLOMITE, LIMESTONES AND OTHER ALLIED MATERIALS

†IS : 2246- METHODS OF SAMPLING FLUORITE

0.6 Metric system has been adopted in India and all the quantities and dimensions in this standard have been given in that system.

0.7 In reporting the results of a test or analysis, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960 Rules for Rounding Off Numerical Values (*Revised*).

0.8 This standard is intended chiefly to cover the technical provisions relating to the sampling of quartzite and it does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This standard lays down the procedure to be followed in collecting and preparing samples from a lot in order to determine ore sizes, moisture content and the chemical composition of the quartzite in the lot. It details the procedures for sampling of the ores from stock piles, loaded rail wagons, conveyors and ship's holds.

1.1.1 This standard also includes a method for reporting the quality of the bulk of the quartzite sampled.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 **Lot/Stock Pile** — The quantity of quartzite indicated (by the supplier) to be of the same category (*see* 0.3) offered for inspection at one time; a lot may consist of the whole or a part of the quantity ordered for.

2.2 **Sub-lot** — The quantity of ore in each of the groups into which a lot/stock pile is divided for the purpose of sampling.

2.3 **Increment** — The quantity of quartzite collected by filling up the sampling scoop to its capacity in a single motion of the scoop; the quantity obtained by mixing up two or more scoopfuls (as found necessary) is also called an increment.

2.4 **Unit Sample** — The quantity of quartzite drawn to be representative of a portion (section) of a sub-lot.

---

*Under print.

†Under preparation.

2.5 Gross Sample — The quantity of quartzite obtained by mixing together all the increments or unit samples collected from the same sub-lot.

2.6 Laboratory Sample — The quantity of quartzite obtained by reducing a gross sample following a specified procedure and intended for laboratory testing.

2.7 Moisture Sample — A laboratory sample meant exclusively for the determination of moisture content.

3. SAMPLING FROM STOCK PILE

3.0 The stock piles vary greatly in size, particularly in height, and hence, the collection of representative samples from stock pile becomes difficult and costly. Sampling of stock piles may be done by any one of the methods described in **3.1** and **3.2**, preferably by the former method; for following the procedures given in **3.2**, the top surface of the stock pile to be sampled should be flat and even over the whole of the stock pile as far as possible.

3.1 Sampling During Loading or Unloading of Stock Piles

3.1.1 *Sub-lots* — The quantity of quartzite to be loaded into or unloaded from a stock pile shall be considered as divided into the number of sub-lots, of approximately equal weight, specified in Table I.

3.1.1.1 While loading or unloading the quantity of quartzite constituting a sub-lot, the number of increments specified under 'point sampling' in Table II (depending upon the quantity of quartzite in the sub-lot) shall be collected at regular intervals during the whole period of loading or unloading the sub-lot. The increments, each of weight specified in Table III, shall be collected from one or more grabs or baskets (filled with quartzite) used for loading or unloading.

TABLE I NUMBER OF SUB-LOTS INTO WHICH A LOT/STOCK PILE IS TO BE DIVIDED

(*Clauses* 3.1.1, 3.2.1, 4.1, 5.1 *and* 6.1)

Weight of the Lot/Stock Pile (in Metric Tonnes)	No. of Sub-lots
Up to 1 500	2
1 501 to 3 000	3
3 001 ,, 6 000	4
6 001 ,, 10 000	5

TABLE II NUMBER OF UNIT SAMPLES/INCREMENTS TO BE COLLECTED FROM A SUB-LOT

(*Clauses* 3.1.1.1, 3.2.1.1, 3.2.1.2, 4.1.1, 4.1.2, 4.1.3 *and* 5.1.1)

WEIGHT OF THE SUB-LOT (IN METRIC TONNES)	SECTIONAL SAMPLING, *NUMBER OF UNIT SAMPLE FOR			POINT SAMPLING, NUMBER OF INCREMENTS FOR		
	Run-of-Mine (up to 250 mm in size)	Crushed and Screened, Large Size (not more than 150 mm and not less than 50 mm in size)	Crushed and Screened, Small Size (not more than 50 mm in size)	Run-of-Mine (up to 250 mm in size)	Crushed and Screened, Large Size (not more than 150 mm and not less than 50 mm in size)	Crushed and Screened, Small Size (not more than 50 mm in size)
Up to 100	1	1	1	4	8	10
101 to 200	2	1	1	6	14	20
201 „ 300	3	2	1	8	22	30
301 „ 400	4	3	2	10	30	40
401 „ 500	5	3	2	12	36	48
501 „ 600	5	4	3	18	48	60
601 „ 700	6	5	3	24	54	72
701 „ 800	7	5	4	36	60	84
801 „ 900	8	6	4	36	72	96
901 „ 1 000	9	7	5	48	72	96
1 001 „ 1 200	11	8	5	48	76	120
1 201 „ 1 400	14	10	7	60	120	160
1 401 „ 1 700	16	12	8	60	120	180
1 701 „ 2 000	18	14	10	90	150	210

*This refers to the number of unit samples to be collected from a sub-lot whose height is one metre. This should be increased or decreased according to the height of the sub-lot by multiplying the corresponding figures by the ratio:

$$\frac{1}{\text{(Height of the sub-lot in metres)}}$$

and rounding off the value so obtained to the nearest integer.

TABLE III WEIGHT OF THE INCREMENTS

(*Clauses* 3.1.1.1, 3.2.1.2, 4.1.1, 4.1.3 *and* 5.1.1)

CATEGORY OF QUARTZITE	WEIGHT OF THE INCREMENT kg
Run-of-mine (up to 250 mm in size)	25
Crushed and screened, large size (not more than 150 mm and not less than 50 mm in size)	10
Crushed and screened, small size (not more than 50 mm in size)	5

3.1.2 *Gross Samples* — All the increments collected from the same sub-lot shall be mixed together to constitute a gross sample.

3.2 Sampling a Completed Stock Pile

3.2.1 *Sub-lots* — Ore in the stock pile shall be divided into the number of sub-lots of approximately equal weight, specified in Table I by suitably marking the line of demarcation on the surface of the stock pile. The ore surface in the sub-lot shall be levelled before sampling. The sub-lots shall be sampled either by the method of sectional sampling (*see* **3.2.1.1**) or by the method of point sampling (*see* **3.2.1.2**).

3.2.1.1 *Sectional sampling* — The number of unit samples to be collected from a sub-lot shall depend upon the quantity of quartzite in the sub-lot in accordance with Table II. For collecting these unit samples, an equal number of points shall be located on the central longitudinal line of the ore surface in the sub-lot.

At every selected point, a unit sample shall be collected by taking the whole section of the ore from top to bottom over an area of a circle of 30 cm diameter. For doing so, ore from the surface down to a depth of approximately 45 cm shall be collected first. The bottom of the hole so formed shall be covered with a plate and the ore lying round this hole shall be removed up to the plate so that when the hole is dug further (to collect the unit sample) the ores from sides can not fill the hole by falling down. This is repeated till the bottom is reached.

3.2.1.2 *Point sampling* — The number of increments to be collected from a sub-lot shall depend upon the quantity of quartzite in the sub-lot, in accordance with Table II. For collecting these increments, each of weight specified in Table III, an equal number of points shall be located on (a) longitudinal parallel lines 1·5 m apart over the whole surface and (b) transverse parallel lines 1·0 m apart on the exposed sides of the sub-lot. The points shall be located so as to be evenly distributed over all the lines.

At each of these points a hole of 40-cm depth shall be made and increments shall be taken from it by the scoop. Care should be taken to prevent the ores from spilling over the edges of the scoop. The average granulometric composition of the increment must be as near as possible to the composition of the ore being sampled.

While sampling run-of-mine quartzite, if a lump of size over 250 mm is encountered at any point, the lump shall be picked up as it is (without breaking into pieces) to be accounted for in the determination of ore size distribution as given under **7.3.2.1** and in the reduction of gross sample as given under **8.1**.

3.2.2 *Gross Samples* — All the increments/unit samples collected from the same sub-lot shall be mixed together to constitute a gross sample.

3.3 Thus, a lot will be represented by as many gross samples as the number of sub-lots into which it has been divided. Each gross sample shall be processed further individually in accordance with **7** and **8** and tested in accordance with **9**.

4. SAMPLING FROM WAGONS

4.0 Representative samples of quartzite may be collected either during the loading or unloading of the wagons, that is, when quartzite is in motion (*see* **4.1.1**), or from loaded wagons, the former method being preferable. While sampling from the loaded wagons, the ore surface of all the wagons shall be levelled and the samples may be drawn either by the method of sectional sampling (*see* **4.1.2**) or by the method of point sampling (*see* **4.1.3**).

4.1 Sub-lots — For the purpose of sampling, all the wagons in the lot shall be divided into the number of sub-lots of approximately equal weight specified in Table I.

4.1.1 *Sampling During Loading and Unloading* — For sampling quartzite when it is being loaded into or unloaded from wagons, the number of increments specified under ' point sampling ' in Table II (depending upon the quantity of quartzite in the sub-lot) shall be collected at regular intervals during the whole period of loading or unloading each sub-lot. The increments, each of weight specified in Table III, shall be collected from one or more grabs or baskets (filled with quartzite) used for the job.

4.1.2 *Sectional Sampling* — The number of unit samples to be collected from a sub-lot shall depend upon the quantity of quartzite in the sub-lot and be in accordance with Table II. For collecting these unit samples, an equal number of points shall be located on the central longitudinal line of the ore surface of all the wagons in the sub-lot. At each of such points, a unit sample shall be collected as indicated in **3.2.1.1**.

4.1.3 *Point Sampling* — The number of increments to be collected from a sub-lot shall depend upon the quantity of quartzite in the sub-lot and be in accordance with Table II. For collecting these increments, each of weight specified in Table III, an equal number of points shall be located on the ore surface of all the wagons in the sub-lot to be sampled, in a chequer-board fashion. Figure 1 illustrates the location of sampling points in a chequer-board fashion, for taking 20 increments from a sub-lot of given size. At each of such points, an increment shall be collected as indicated in **3.2.1.2**.

4.2 Gross Samples — All the increments/units samples collected from the same sub-lot shall be mixed together to constitute a gross sample.

AMENDMENT NO. 1 SEPTEMBER 1972
TO
IS : 2245-1962 METHODS OF SAMPLING QUARTZITE

In order to make the procedure for sampling from wagons more economical and practical, the Methods of Sampling Sectional Committee, responsible for the preparation of this standard, decided to issue the following amendment.

Addendum

(*Page* 8, *clause* **4.1.3**) — Add the following Note under this clause:

'NOTE — In the case of smaller lots of not more than 5 wagons, the unit samples/increments shall be collected from each of the wagons in the sub-l t according to the methods given in **4.1.2** or **4.1.3**. However, in the case of larger lots of more than 5 wagons, at least 25 percent of the wagons, subject to a minimum of 5, shall be selected at random from the sub-lot and then the required number of unit samples/increments be evenly distributed over the selected wagons.'

(SMDC 4)

Reproduced by Reprography Unit, ISI, New Delhi

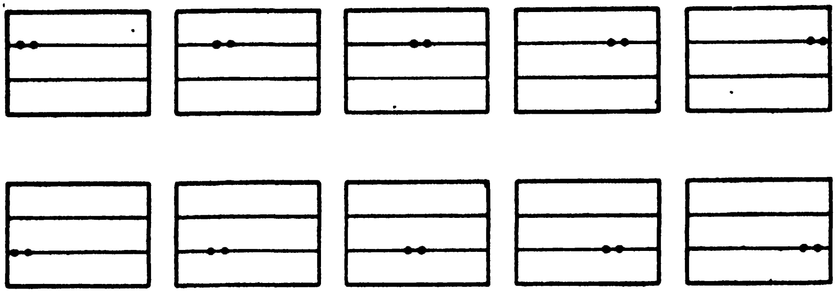

Fig. 1 Illustration of the Location of Sampling Points for Taking 20 Increments from a Sub-lot of 200 Tonnes of Crushed and Screened, Small Size Ore

4.3 Thus, a lot will be represented by as many gross samples as the number of sub-lots into which it has been divided. Each gross sample shall be processed further individually in accordance with **7** and **8** and tested in accordance with **9**.

5. SAMPLING FROM SHIP'S HOLDS

5.1 Sub-lots — The quantity of quartzite in the ship's holds, constituting a lot, shall be divided into the number of sub-lots of approximately equal weight, specified in Table I.

5.1.1 The number of increments to be collected from a sub-lot, shall depend upon the quantity of quartzite in the sub-lot in accordance with Table II (under point sampling). The increments shall be collected at regular intervals during the whole period of loading or unloading the material in the sub-lot. The increments, each of weight specified in Table III, shall be collected from one or more grabs or baskets (filled with quartzite) used for loading or unloading.

5.2 Gross Samples — All the increments collected from the same sub-lot shall be mixed together to constitute a gross sample.

5.3 Thus, a lot will be represented by as many gross samples as the number of sub-lots into which it has been divided. Each gross sample shall be processed further individually in accordance with **7** and **8** and tested in accordance with **9**.

6. SAMPLING FROM CONVEYORS

6.1 Sub-lots — For the purpose of sampling, the quantity of quartzite to be discharged over a conveyor shall be considered as divided into the number of sub-lots, specified in Table I.

6.1.1 While the quantity of quartzite constituting a sub-lot is moving on the conveyor, the number of unit samples specified in Table IV (depending upon the quantity of quartzite in the sub-lot), shall be collected at regular intervals during the whole period required to discharge the ore in the sub-lot. Each unit sample shall consist of the full width and thickness of approximately 1·5 m length of the ore stream, the weight of a unit sample being not less than 400 kg. If the stopping of the conveyor is not practicable for collecting the unit sample, they shall be collected at the discharge end, using some mechanical device.

TABLE IV NUMBER OF UNIT SAMPLES FOR SAMPLING FROM CONVEYOR

WEIGHT OF THE SUB-LOT (IN METRIC TONNES)	*NUMBER OF UNIT SAMPLES FOR		
	Run-of-Mine (up to 250 mm in size)	Crushed and Screened, Large Size (not more than 150 mm and not less than 50 mm in size)	Crushed and Screened, Small Size (not more than 50 mm in size)
Up to 500	1	1	1
501 to 1 000	2	2	1
1 001 „ 1 500	3	2	2
1 501 „ 2 000	4	3	2

*Weight of each unit sample shall not be less than 400 kg.

6.2 **Gross Samples** — All the unit samples collected from the same sub-lot shall be mixed together to constitute a gross sample.

6.3 Thus, a lot will be represented by as many gross samples as the number of sub-lots into which it has been divided. Each gross sample shall be processed further individually in accordance with 7 and 8 and tested in accordance with 9.

7. DETERMINATION OF ORE SIZES

7.1 The size distribution of the quartzite in a lot shall normally be estimated as recommended below:

a) Over 250 mm,
b) Under 250 mm and over 150 mm,
c) Under 150 mm and over 50 mm,
d) Under 50 mm and over 10 mm,
e) Under 10 mm and over 1 mm, and
f) Under 1 mm.

If necessary, ores of other sizes may also be estimated.

NOTE — In the determination of ore size distribution, sieves of suitable sizes specified in *IS : 460-1953 Specification for Test Sieves, shall be used, wherever possible.

7.2 Gross Samples by Sectional Sampling

7.2.1 Each gross sample shall be screened successively through selected sieves (*see* 7.1) and the quantity of the ore retained on each of the sieves as also passing through the smallest sieve, shall be weighed separately and recorded.

7.2.1.1 Ore size distribution for the lot shall be estimated as follows:

a) Over 250 mm (%) $$\frac{a_1 + a_2 + \ldots\ldots}{w_1 + w_2 + \ldots\ldots} \times 100$$

b) Under 250 mm and over 150 mm (%) $$\frac{b_1 + b_2 + \ldots\ldots}{w_1 + w_2 + \ldots\ldots} \times 100$$

c) Under 150 mm and over 50 mm (%) $$\frac{c_1 + c_2 + \ldots\ldots}{w_1 + w_2 + \ldots\ldots} \times 100$$

d) Under 50 mm and over 10 mm (%) $$\frac{d_1 + d_2 + \ldots\ldots}{w_1 + w_2 + \ldots\ldots} \times 100$$

e) Under 10 mm and over 1 mm (%) $$\frac{e_1 + e_2 + \ldots\ldots}{w_1 + w_2 + \ldots\ldots} \times 100$$

f) Under 1 mm (%) $$\frac{f_1 + f_2 + \ldots\ldots}{w_1 + w_2 + \ldots\ldots} \times 100$$

where

w_1, w_2, w_3.................. are the weights of the different gross samples,

a_1, a_2, a_3.................. are the corresponding weights of ore of size exceeding 250 mm,

b_1, b_2, b_3.................. are the corresponding weights of ore of size under 250 mm and over 150 mm,

c_1, c_2, c_3.................. are the corresponding weights of ore of size under 150 mm and over 50 mm,

d_1, d_2, d_3.................. are the corresponding weights of ore of size under 50 mm and over 10 mm,

---

*Under revision.

e_1, e_2, e_3.................. are the corresponding weights of ore of size under 10 mm and over 1 mm, and

f_1, f_2, f_3.................. are the corresponding weights of ore of size under 1 mm.

Note — Percentage of ore of any other desired size shall be calculated on similar lines.

7.3 Gross Samples by Point Sampling

7.3.1 Where the gross samples do not contain any lump over 250 mm, the procedure detailed in **7.2.1** and **7.2.1.1** shall be followed for estimating the ore size distribution in the lot, the percentage of ore over 250 mm being nil.

7.3.2 Where the gross samples contain some lumps over 250 mm, the portion of the gross samples excluding such lumps shall be treated as in **7.2.1**.

7.3.2.1 The ore size distribution for the lot shall be estimated as follows:

a) Over 250 mm (%)
$$\frac{25n}{(25n) + w'_1 + w'_2 + \ldots\ldots} \times 100$$

b) Under 250 mm and over 150 mm (%)
$$\frac{b_1 + b_2 + \ldots\ldots\ldots\ldots\ldots\ldots}{(25n) + w'_1 + w'_2 + \ldots\ldots} \times 100$$

c) Under 150 mm and over 50 mm (%)
$$\frac{c_1 + c_2 + \ldots\ldots\ldots\ldots\ldots\ldots}{(25n) + w'_1 + w'_2 + \ldots\ldots} \times 100$$

d) Under 50 mm and over 10 mm (%)
$$\frac{d_1 + d_2 + \ldots\ldots\ldots\ldots\ldots\ldots}{(25n) + w'_1 + w'_2 + \ldots\ldots} \times 100$$

e) Under 10 mm and over 1 mm (%)
$$\frac{e_1 + e_2 + \ldots\ldots\ldots\ldots\ldots\ldots}{(25n) + w'_1 + w'_2 + \ldots\ldots} \times 100$$

f) Under 1 mm (%)
$$\frac{f_1 + f_2 + \ldots\ldots\ldots\ldots\ldots\ldots}{(25n) + w'_1 + w'_2 + \ldots\ldots} \times 100$$

where

w'_1, w'_2.................. are the weights (in kg) of the different gross samples excluding the lumps over 250 mm;

n is the total number of lumps over 250 mm in all the gross samples; and

b_1, b_2,...; c_1, c_2,...; d_1, d_2,...; etc are as defined in **7.2.1.1**.

8. REDUCTION OF A GROSS SAMPLE

8.1 Each gross sample shall be reduced separately. Each individual size group of ore above 50 mm in the gross sample (including the lumps of over 250 mm as obtained in **3.2.1.2**) shall be crushed separately to below 50 mm with jaw crusher, roll crusher or by manual labour using pounder and a manganese steel plate. This crushed ore shall be thoroughly mixed and proportionate quantities from each size group including those less than 50 mm of the ore shall be taken to obtain 50 kg of the gross sample. The portion of the gross sample so obtained shall be mixed well and reduced in stages as detailed in Fig. 2 to prepare the moisture sample for the determination of moisture content and laboratory samples for the determination of chemical composition. For reduction at various stages either of the methods detailed in **8.1.1** or **8.1.2** shall be followed. Each moisture sample and laboratory sample shall weigh 600 g.

8.1.1 *Reduction by Coning and Quartering* — The crushed ore shall be well mixed and then scooped into a cone-shaped pile. Care shall be taken to drop each scoopful exactly over the same spot as otherwise the central axis of the cone will be slackened and an uneven distribution of lumps and fines will result. After the cone is formed, it shall be flattened by pressing the top of the cone with the smooth surface of the scoop. Then it is cut into quarters by two lines which intersect at right angles at the centre of the cone. The bulk of the sample is reduced by rejecting any two diagonally opposite quarters.

8.1.2 *Reduction by Using Sample Splitter or Riffle Sampler* — Mechanical quartering is best done with a riffle. After each crushing, the ore shall be well mixed and poured into the riffle. This process shall be repeated using different size riffles according to the size of the crushed ore.

8.2 The material in each moisture sample and laboratory sample shall be thoroughly mixed and divided into three approximately equal parts. A set consisting of material from each of the moisture sample and laboratory sample drawn from a single lot shall be given to the purchaser; another such set shall be given to the supplier and the third set shall be kept under seal as a referee sample.

8.2.1 All the moisture samples and the laboratory samples shall be preserved in dry, clean and well-stoppered bottles, labelled with full identification such as the source of the ore, the category of the ore (*see* **0.3**), the supplier's name, the lot number and the date of sampling. These samples shall be sent to a laboratory, mutually agreed upon by the purchaser and the supplier, for the determination of chemical composition and moisture content.

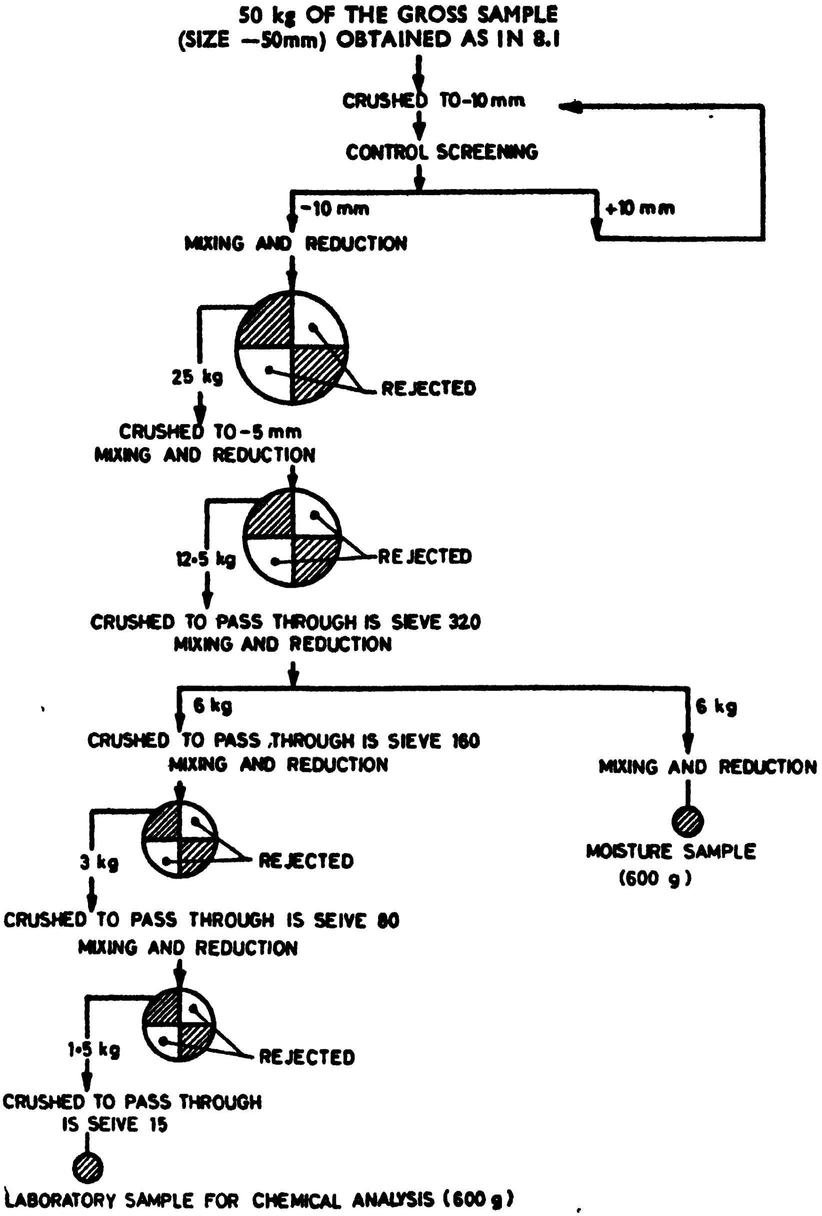

Fig. 2 Stages in Reducing a Gross Sample

9. NUMBER OF TESTS

9.1 All the moisture samples representing a lot shall be tested individually for moisture content. All the laboratory samples for chemical analysis shall be tested individually for important characteristics; for the remaining, a composite sample prepared by mixing equal quantities of the ore from each of the laboratory samples shall be analysed. The chemical characteristics for which each laboratory sample is to be analysed individually and also those for which a composite sample is to be tested, shall be as given in Table V, unless otherwise agreed to between the purchaser and the vendor.

TABLE V NUMBER OF TESTS

CHEMICAL CONSTITUENTS OF QUARTZITE FOR WHICH	
Laboratory Samples are Analysed Individually	A Composite Sample is Analysed
Al_2O_3	CaO
Fe_2O_3	MgO
SiO_2	Alkalies Loss on ignition

10. REPORTING

10.1 Reporting of Chemical Composition

10.1.1 For those characteristics, where a composite sample has been tested, only one test result will be available and that result shall be reported as the value of the characteristic for the lot sampled.

10.1.2 When only two laboratory samples have been analysed individually from a lot, the average of the two available test results shall be reported as the value of the characteristic for the lot sampled. The individual test results shall also be reported to give an indication of the range of variation in quality.

10.1.3 When three or more laboratory samples have been analysed individually from a lot, the quality of the lot sampled with reference to each of the characteristics shall be reported as follows:

Let $x_1, x_2, x_3, \ldots\ldots\ldots\ldots\ldots\ldots x_n$ be the results of analysing '*n*' laboratory samples for a particular characteristic.

Calculate

$$\text{Average } (\bar{x}) = \frac{(x_1 + x_2 + x_3 + \ldots\ldots\ldots x_n}{n}$$

and Range (R) = the difference between the maximum and the minimum values

The average level of that characteristic in the lot shall be reported as equal to $\bar{x}$.

The limits of variation in the average level of that characteristic in the lot shall be reported as ($\bar{x} \pm hR$), where '*h*' is a factor the value of which depends upon the number of laboratory samples analysed. The appropriate value of the factor '*h*' shall be taken from Table VI.

TABLE VI VALUES OF THE FACTOR '*h*'

NUMBER OF LABORATORY SAMPLE ANALYSED	VALUE OF THE FACTOR '*h*'
3	1·30
4	0·72
5	0·51

10.2 Reporting of Moisture Content

10.2.1 The results obtained by testing all the moisture samples representing a lot individually shall be reported in accordance with **10.1.2** or **10.1.3**.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	$1\ \text{N} = 1\ \text{kg.1 m/s}^2$
Energy	joule	J	$1\ \text{J} = 1\ \text{N.m}$
Power	watt	W	$1\ \text{W} = 1\ \text{J/s}$
Flux	weber	Wb	$1\ \text{Wb} = 1\ \text{V.s}$
Flux density	tesla	T	$1\ \text{T} = 1\ \text{Wb/m}^2$
Frequency	hertz	Hz	$1\ \text{Hz} = 1\ \text{c/s}\ (\text{s}^{-1})$
Electric conductance	siemens	S	$1\ \text{S} = 1\ \text{A/V}$
Pressure, stress	pascal	Pa	$1\ \text{Pa} = 1\ \text{N/m}^2$

INDIAN STANDARDS INSTITUTION

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones : 26 60 21, 27 01 31 Telegrams : Manaksanstha

Regional Offices:

		Telephone
Western : Novelty Chambers, Grant Road	BOMBAY 400007	37 97 29
Eastern : 5 Chowringhee Approach	CALCUTTA 700072	23-08 02
Southern : C. I. T. Campus, Adyar	MADRAS 600020	41 24 42

Branch Offices:

'Pushpak', Nurmohamed Shaikh Marg, Khanpur	AHMADABAD 380001	2 03 91
'F' Block, Unity Bldg, Narasimharaja Square	BANGALORE 560002	2 76 49
Gangotri Complex, Bhadbhada Road, T.T. Nagar	BHOPAL 462003	6 27 16
22E Kalpana Area	BHUBANESHWAR 751014	5 36 27
Ahimsa Bldg, SCO 82-83, Sector 17C	CHANDIGARH 160017	2 83 20
5-8-56C L. N. Gupta Marg	HYDERABAD 500001	22 10 83
D-277 Todarmal Marg, Banipark	JAIPUR 302006	6 98 32
117/418 B Sarvodaya Nagar	KANPUR 208005	8 12 72
Patliputra Industrial Estate	PATNA 800013	6 28 08
Hantex Bldg (2nd Floor), Rly Station Road	TRIVANDRUM 695001	32 27

Reproduced by Reprography Unit, ISI, New Delhi